

CLAIMS

1. An organic polymer composite zinc alloy electroplating solution composition containing:

- (A) 1 to 600 g/l of Zn ion,
- (B) 1 to 600 g/l of an iron-group-element ion,
- (C) 0.1 to 200 g/l, in terms of W ion, of tungstic acid-based compound, and
- (D) 0.5 to 500 g/l of water-soluble or water-dispersible organic polymer compound having a number average molecular weight of 1,000 to 1,000,000.

2. The organic polymer composite zinc alloy electroplating solution composition according to claim 1, wherein the iron-group-element ion (B) is Fe ion.

3. The organic polymer composite zinc alloy electroplating solution composition according to claim 1 or 2, wherein the tungstic acid-based compound (C) is at least one compound selected from the group consisting of tungstic acid, tungstate salts, phosphotungstic acid, and phosphotungstate salts.

4. The organic polymer composite zinc alloy electroplating solution composition according to any one

of claims 1 to 3, wherein the organic polymer compound (D) has at least one hydrophilic group selected from the group consisting of nonionic hydrophilic groups, anionic hydrophilic groups, and cationic hydrophilic groups.

5. The organic polymer composite zinc alloy electroplating solution composition according to any one of claims 1 to 4, wherein the organic polymer compound (D) has at least one hydrophilic group selected from the group consisting of a hydroxyl group, a sulfonic acid group, a phosphoric acid group, a carboxyl group, an amino group, and an ammonium group.

6. The organic polymer composite zinc alloy electroplating solution composition according to any one of claims 1 to 5, which further contains 5 to 300 g/l of a corrosion-inhibiting pigment and/or ceramic particles.

7. The organic polymer composite zinc alloy electroplating solution composition according to claim 6, wherein the corrosion-inhibiting pigment is at least one selected from the group consisting of phosphate salts, molybdate salts, metaborate salts, and silicate salts.

8. The organic polymer composite zinc alloy

electroplating solution composition according to claim 6, wherein the ceramic particles are particles of at least one selected from the group consisting of Al_2O_3 , SiO_2 , TiO_2 , ZrO_2 , Y_2O_3 , ThO_2 , CeO_2 , Fe_2O_3 , B_4C , SiC , WC , ZrC , TiC , graphite, graphite fluoride, BN , Si_3N_4 , TiN , Cr_3B_2 , ZrB_2 , $2\text{MgO}\cdot\text{SiO}_2$, $\text{MgO}\cdot\text{SiO}_2$, and $\text{ZrO}_2\cdot\text{SiO}_2$.

9. The organic polymer composite zinc alloy electroplating solution composition according to any one of claims 1 to 8, which further contains 0.01 to 10 g/l of at least one organic compound selected from the group consisting of alkynes, alkynols, amines or salts thereof, thio compounds, aromatic carboxylic acid compounds or salts thereof, and heterocyclic compounds.

10. An organic polymer composite zinc alloy electroplated metal material, which is obtainable by electroplating a metal raw material using the organic polymer composite zinc alloy electroplating solution composition according to any one of claims 1 to 9.

11. The organic polymer composite zinc alloy electroplated metal material according to claim 10, which is obtained by bringing the film formed by the electroplating into contact with an acidic aqueous

solution of a compound containing at least one element selected from the group consisting of cobalt, nickel, titanium, and zirconium.

12. A fingerprint-resistant steel plate wherein an organic resin film is directly formed on the organic polymer composite zinc alloy electroplated metal material according to claim 10 or 11 without surface treatment.

13. A lubricating steel plate wherein an organic resin film is directly formed on the organic polymer composite zinc alloy electroplated metal material according to claim 10 or 11 without surface treatment.